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PHYTOTOXICOLOGY ASSESSMENT SURVEY INVESTIGATION IN THE VICINITY OF MORTERM LTD., WINDSOR - 1986

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Jim Bradley
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Phytotoxicology Assessment Survey Investigation in the Vicinity of Morterm Ltd., Windsor - 1986

Phytotoxicology Section
Air Resources Branch

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Author: George N. Vasiloff

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Background

Since 1976, the Phytotoxicology Section has conducted an annual surveillance of grasses at 10 established sites in the vicinity of Morterm Limited (previously known as the Morton Terminal Limited) in order to monitor levels of fluoride. An additional site (11) was added in 1985.

In addition to the handling of other commodities, this port facility is involved with the transfer of bulk fluorspar from ships to temporary open storage on the terminal property.

According to the Windsor Ministry office, the fluorspar is unloaded from bulk cargo carriers by clam shovels and deposited on the dock. Due to its fine particle size, the material is handled wet in the ship (approximately 10% H_2O).

When the fluorspar is piled on the dock the surface areas dry rapidly and because of its fine particle size, can become airborne easily. To prevent this from happening, Morterm staff are supposed keep the pile wetted with a firehose.

The fluorspar is loaded by front-end loaders into bulk trucks which are provided with tarps to minimize material loss when in transit.

During the occasion of the 1985 Phytotoxicology visit to the property, fluorspar was being loaded from a large open pile into dump trucks with a front-end loader. A terminal employee was observed washing down the dust which liberally covered the immediate area surrounding the fluorspar pile.

Immediately south of Morterm, the Maple Leaf Monarch company operates grain storage elevators and a large grain loading facility. Farther south along the river, the Canadian Rock Salt Company extracts salt (NaCl) from a mine on the property. Mined salts are stored in large open piles pending shipment.

The relative locations of these three companies and their spatial relationship to the Phytotoxicology grass sampling locations are shown in Figure 1.

Results of previous Phytotoxicolgy surveys have shown that grasses immediately adjacent to the Morterm facility contained elevated levels of fluoride but that the zone of contamination was relatively small.

The previous results also identified a small problem involving salt. Grass samples from surveillance sites (1, 2 and 3) adjacent to the Canadian Rock Salt Company were found to contain elevated levels of sodium and chloride. Once again, the area of influence was found to be relatively confined.

Depuis 1976, la Section de phytotoxicologie effectue un contrôle annuel du gazon à 10 emplacements dans les environs de la société Morterm Limited (connue anciennement sous le nom de Morton Terminal Limited) afin d'y mesurer la concentration de fluorure. Un emplacement supplémentaire (pour un total de 11) a été ajouté en 1985.

Outre la manutention d'autres marchandises, cette société portuaire effectue le transfert de spath fluor en vrac des navires à ses installations d'entreposage temporaire à ciel ouvert.

Selon le bureau de Windsor du ministère, le spath fluor est déchargé des transporteurs en vrac à l'aide de pelles à benne preneuse et déversé sur le quai. Comme la substance se présente sous forme de particules fines, on y ajoute de l'eau dans une proportion approximative de 10 % pour la manutention.

Une fois que le spath fluor est déversé sur le quai, la surface du tas sèche rapidement, et le vent emporte facilement les fines particules. Pour éviter cette situation, les employés de Morterm doivent garder le tas humide en l'arrosant à l'aide d'un boyau d'incendie.

Des camions à chargement frontal déversent le spath fluor dans des camions munis de bâches pour minimiser les pertes pendant le transport.

En 1985, lors de la visite des installations par la Section de phytotoxicologie, un camion à chargement frontal prenait du spath fluor dans un grand tas pour le verser dans des camions-bennes. Un employé arrosait la poussière qui recouvrait la zone entourant immédiatement le tas.

Juste au sud de Morterm, la société Maple Leaf Monarch exploite des élévateurs à grains ainsi que de grandes installations de chargement de céréales. Plus loin au sud le long de la rivière, la Canadian Rock Salt Company extrait du sel d'une mine située sur ses terrains. Le sel extrait est entassé à ciel ouvert en attendant l'expédition.

L'emplacement relatif de ces trois sociétés ainsi que leur situation par rapport aux emplacements où la Section de phytotoxicologie a prélevé du gazon sont précisés à la figure 1.

Les résultats d'études précédentes ont montré que le gazon situé autour des installations de Morterm contenait une forte concentration de fluorure, mais que la zone de contamination était relativement petite.

Ces études antérieures ont également permis d'identifier un problème mineur en ce qui concerne le sel. Des échantillons prélevés à trois emplacements (1, 2 et 3) près de la Canadian Rock Salt contenaient des concentrations élevées de sodium et de chlore. Encore une fois, la zone touchée était relativement restreinte.

1986 Phytotoxicology Surveillance

At each of the previously established 11 sample locations, true triplicate samples of grass were collected for chemical analysis. Samples were submitted to the Phytotoxicology laboratory in Toronto for pre-analysis processing according to a standardized not-wash procedure. Upon completion, processed samples were forwarded to the Ministry's Inorganic Trace Contaminants laboratory for fluoride, calcium, sodium and chloride determinations.

Chemical Analysis Results

Fluoride

Triplicate analytical values of grass obtained from each sample location in 1986 were averaged to provide the single values assembled in Table 1. Fluoride values found from 1976 to 1985 also appear in the Table for comparison purposes.

Examination of the 1986 results indicates that average levels of the element at 7 of the 11 sample sites were higher than in 1985. The highest value (2067 ppm) was found at site 11, which is located immediately across the mooring slip from the terminal where the bulk fluorspar is handled.

The 1985 fluoride average (112 ppm) of the 10 original sample sites was found to be slightly higher than the 91 ppm average of 1984. The 1986 fluoride average (247 ppm) of the 10 sites was more than double those of the previous two sample years.

Since 1976, fluoride levels found at site 3 have been traditionally low. Apart from the 293 ppm average of 1983, all other yearly values have been below 100 ppm. However, in 1986, the average value rose unexplicably to 1180 ppm.

Calcium

All sampled grasses were analyzed for calcium content because of the calcium component found in fluorspar ($CaFl_2$). Average values for the element have been listed in Table 2 for the sample periods from 1981 to 1986.

Two locations with the highest 1986 calcium values were found to be at sample sites 3 and 7. Although site 7 is adjacent to the fluorspar handling area, site 3 is somewhat removed to the south-southeast on Sprucewood Avenue. Coincidentally, the fluoride level at site 7 was relatively high in 1986 but at site 3, the fluoride value was the highest since 1976.

The 1986 all-station average of 6713 ppm (excluding station 11), however, was the lowest since 1981.

Sodium

Average sodium values in grasses at the three sample locations (1, 2 and 3) closest to the Windsor salt mine declined somewhat in 1986 from those of the previous year. In spite of the apparent decline in 1986, values at the three sample locations were clearly found to contain the highest sodium values. (Table 3)

The 1986 all-station average (station 11 excluded) of 193 ppm was lower than the 328 ppm average of 1985 and the 232 ppm of 1984.

Chloride

Chloride values in grasses sampled in the vicinity of Morterm Limited for the period from 1979 to 1986 have been assembled in Table 4. The highest 1986 chloride values were found at sample locations 1 and 3, which are situated close to the salt mine.

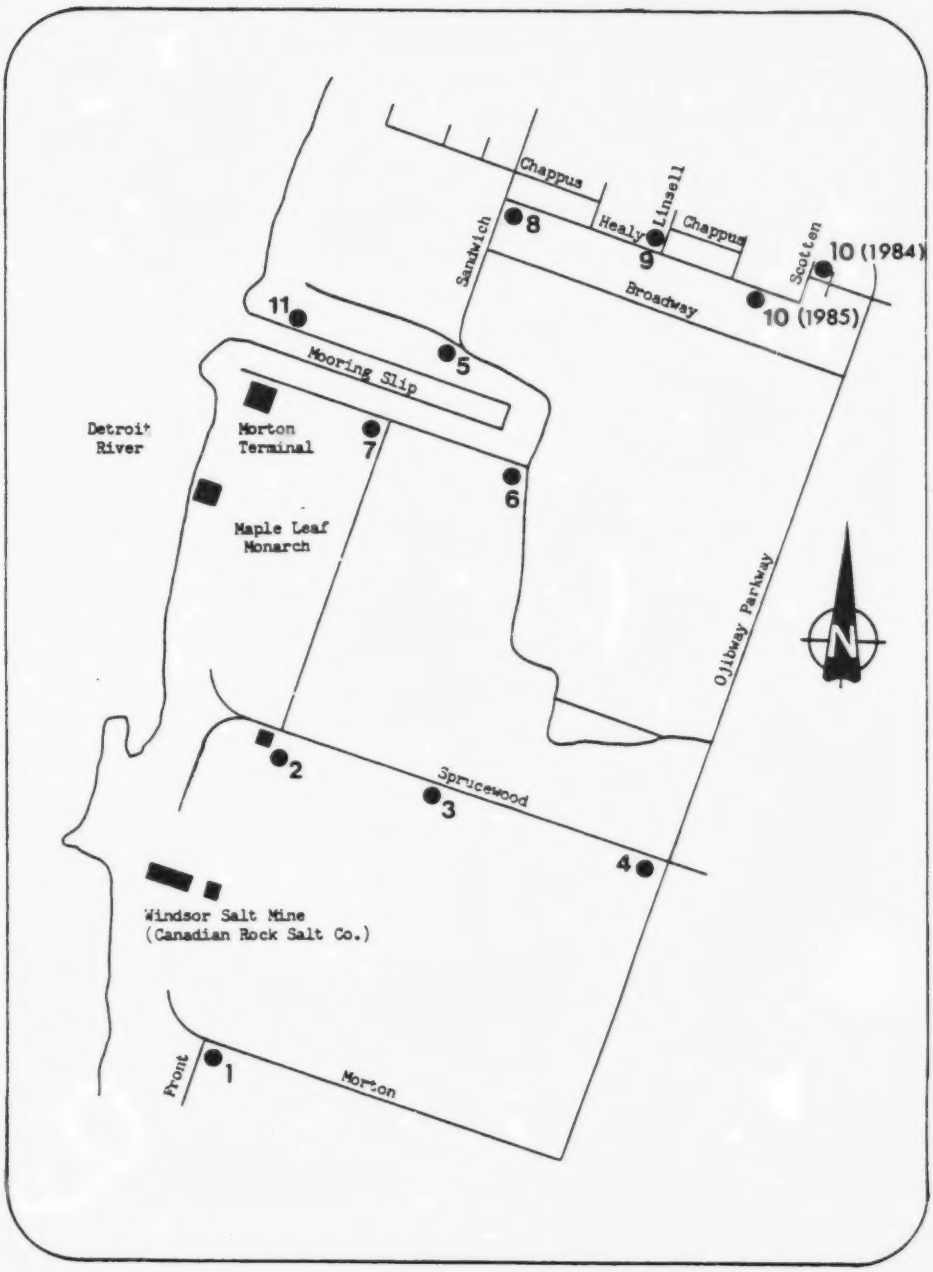
The 1986 average of 0.7% was lower than the 0.9% of 1985 and the 1.0% of 1984.

Conclusions

Analytical results clearly reflect the presense of two distinct and separate sources of chemical contaminants. The high fluoride values found in grasses close to Morterm Ltd. originated from the fluorspar ($CaFl_2$) handled in bulk at the terminal. The grass survey was able to determine that values of the element dropped off significantly with increased distance from the source.

With respect to the elevated sodium and chloride values found in grasses at several locations, it appears extremely likely that they originated from the large exposed salt piles on the property. The grass surveillance has also indicated that the affected area is relatively small and unpopulated.

FIGURE: 1 Map Showing The 11 Grass Sample Locations in the Vicinity of Morterm Limited, 5353 Maplewood Road, Windsor



Not To Scale

TABLE: 1

Fluoride Content of Not-Washed Grass Samples
Collected Near Morterm Limited[1], Windsor
1976 - 1986

Sample Location Number	Fluoride Concentration (ppm, dry weight)										
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	45	16	11	34	22	20	41	39	13	22	17
2	231	54	8	28	22	32	35	40	41	48	23
3	94	32	99	72	28	65	59	293	90	142	1180
4	117	16	8	56	38	118	50	140	71	124	111
5	185	173	96	65	—	55	170	183	143	264	377
6	129	45	64	76	45	208	90	103	112	68	117
7	169	258	560	900	150	1200	368	483	356	234	463
8	115	13	94	47	45	20	129	99	55	65	116
9	32	17	40	26	18	14	76	333	16	32	44
10	55	11	23	28	25	15	40	293	11	128	26
11	-	-	-	-	-	-	-	-	-	1273	2067
Yearly Average	117	64	91	133	44	175	106	201	91	112[2] 217[3]	247[2] 413[3]

[1]Formerly known as the Morton Terminal Limited. [2]Average excluding location 11. [3]Average including location 11.

Note: The Phytotoxicology "upper limit of normal" is 12 ppm. (rural)

TABLE: 2 Calcium Content of Not-Washed Grass Samples Collected Near Morterm Limited[1], Windsor

1981 - 1986

Sample Location Number	Calcium Concentration (ppm, dry weight)					
	1981	1982	1983	1984	1985	1986
1	7200	8300	9200	7867	7067	5367
2	5150	6450	7933	9100	5967	4267
3	4050	9950	7233	7033	7100	10,800
4	4850	7000	8050	7333	8033	8067
5	5600	7400	6100	9567	13333	7400
6	5750	5050	5133	9933	5733	6700
7	6750	12500	9367	11667	7500	9100
8	5400	8950	7100	8133	5733	5700
9	3600	5050	5567	6700	5100	4933
10	5450	7500	6483	6633	4467	4800
11	—	—	—	—	8433	8067
Yearly Average	5380	7815	7217	8397	7063[2]	6713[2]

[1]Formerly known as the Morton Terminal Limited.

[2]Sample location 11 data not included in the yearly average.

TABLE: 3 Sodium Content of Not-Washed Grass Samples Collected Near Morterm Limited[1], Windsor

1979 - 1986

Sample Location Number	Sodium Concentration (ppm, dry weight)							
	1979	1980	1981	1982	1983	1984	1985	1986
1	1520	1500	350	1260	661	993	513	343
2	182	270	150	480	180	570	1010	287
3	238	140	170	830	667	237	1167	953
4	77	105	83	440	71	87	160	93
5	111	-	300	660	20	47	43	32
6	128	53	92	820	50	99	143	37
7	238	68	310	280	36	72	52	83
8	48	71	59	180	42	53	27	28
9	75	68	29	86	52	69	24	25
10	165	84	250	176	108	90	128	53
11	-	-	-	-	-	-	31	47
Yearly Average	279	273	179	521	189	232	328	193[2]

[1]Formerly known as the Morton Terminal Limited.

[2]Sample location 11 data not included in the yearly average.

TABLE: 4 Chloride Content of Not-Washed Grass Samples
Collected Near Morterm Limited[1], Windsor
1979 - 1986

Sample Location Number	Chloride Concentration (%, dry weight)							
	1979	1980	1981	1982	1983	1984	1985	1986
1	0.43	0.47	0.4	0.8	0.9	1.8	1.5	1.1
2	0.26	1.55	0.9	0.5	0.8	0.6	1.1	0.3
3	0.40	0.37	0.3	0.2	0.7	1.1	1.5	1.2
4	0.24	0.75	0.9	0.7	0.8	1.2	0.8	0.6
5	0.39	-	0.7	0.3	0.6	0.6	0.4	0.2
6	0.53	0.37	0.8	0.2	0.5	0.4	0.6	0.3
7	0.60	0.22	0.5	0.6	0.9	0.9	0.6	0.8
8	0.24	0.52	1.1	0.8	0.7	1.1	0.7	0.7
9	0.46	0.70	0.5	0.7	0.6	1.2	0.9	0.8
10	1.27	1.15	2.0	1.1	0.6	1.5	1.4	0.8
11	-	-	-	-	-	-	0.4	0.3
Yearly Average	0.5	0.6	0.8	0.6	0.7	1.0	0.9[2]	0.7[2]

[1]Formerly known as the Morton Terminal Limited.

[2]Sample location 11 data not included in the yearly average.